

What is claimed is:

1. A semiconductor device comprising:

a semiconductor element having plural electrodes on a circuit forming surface,

a wiring formed at least on said circuit forming surface, having one end connected to said electrodes,

a bump electrode connected to said wiring,

a sealing resin for exposing the surface of said bump electrode and sealing the circuit forming surface of said semiconductor element, and

a ball electrode formed on the surface of said bump electrode exposed from said resin,

wherein a part of said wiring is formed also at the side surface of said semiconductor element, and said bump electrode is formed so that the side surface of the bump electrode may be nearly flush with said wiring formed at the side surface of said semiconductor element,

at least a part of said ball electrode is formed so as to be electrically connected to said wiring at the side surface of said semiconductor element, and

the side surface of said semiconductor element is sealed with resin exposing said wiring, and the confronting surface of said circuit forming surface is sealed with resin on the entire surface including the end surface of the wiring formed at the side surface of the semiconductor element.

2. A stack type semiconductor device having a semiconductor device of claim 1 mounted on a second semiconductor device having

0933347-05101
FOI 50 7483360

plural ball electrodes, so that the confronting surface of its circuit forming surface may be a contact surface, and

bump electrodes of the semiconductor device of claim 1 and the wiring at the side surface of the semiconductor device are connected to the electrodes of the second semiconductor device through said ball electrodes.

3. The stack type semiconductor device of claim 2,

wherein one or two or more semiconductor devices of claim 1 are mounted further on the semiconductor device of claim 1 mounted on the second semiconductor device, and

said bump electrodes of the semiconductor device of claim 1 and the wiring at the side surface of the semiconductor device are connected mutually through said ball electrodes.

4. A semiconductor device comprising:

a semiconductor element having plural electrodes on a circuit forming surface,

a wiring formed at least on said circuit forming surface, having one end connected to said electrodes,

a bump electrode connected to said wiring,

a sealing resin for exposing the surface of said bump electrode and sealing the circuit forming surface of said semiconductor element, and

a ball electrode formed on the surface of said bump electrode exposed from said resin,

wherein a part of said wiring is formed also at the side surface of

054101 "422860"

said semiconductor element, and said bump electrode is formed so that the side surface of the bump electrode may be nearly flush with said wiring formed at the side surface of said semiconductor element,

at least a part of said ball electrode is formed so as to be electrically connected to said wiring at the side surface of said semiconductor element, and

the side surface of said semiconductor element is sealed with resin exposing said wiring, and the confronting surface of said circuit forming surface is sealed with resin on the other surface than the end surface of the wiring formed at the side surface of the semiconductor element.

5. A stack type semiconductor device having a semiconductor device of claim 4 mounted on a second semiconductor device having plural ball electrodes, so that the confronting surface of its circuit forming surface may be a contact surface, and

bump electrodes of the semiconductor device of claim 4 and the wiring at the side surface of the semiconductor device are connected to the electrodes of the second semiconductor device through said ball electrodes.

6. The stack type semiconductor device of claim 2,

wherein one or two or more semiconductor devices of claim 4 are mounted further on the semiconductor device of claim 4 mounted on the second semiconductor device, and

said bump electrodes of the semiconductor device of claim 4 and the wiring at the side surface of the semiconductor device are connected

09352347 "051101

mutually through said ball electrodes.

7. The stack type semiconductor device of claim 2, wherein one or two or more semiconductor devices of claim 1, or semiconductor devices each comprising a semiconductor element having plural electrodes on a circuit forming surface, a wiring formed at least on said circuit forming surface, having one end connected to said electrodes, a bump electrode connected to said wiring, a sealing resin for exposing the surface of said bump electrode and sealing the circuit forming surface of said semiconductor element, and a ball electrode formed on the surface of said bump electrode exposed from said resin, in which a part of said wiring is formed also at the side surface of said semiconductor element, and said bump electrode is formed so that the side surface of the bump electrode may be nearly flush with said wiring formed at the side surface of said semiconductor element, at least a part of said ball electrode is formed so as to be electrically connected to said wiring at the side surface of said semiconductor element, and the side surface of said semiconductor element is sealed with resin exposing said wiring, and the confronting surface of said circuit forming surface is sealed with resin on the other surface than the end surface of the wiring formed at the side surface of the semiconductor element, are mounted further on the semiconductor device of claim 1 mounted on the second semiconductor device, and said bump electrodes of the mounted semiconductor device and the wiring at the side surface of the semiconductor device are connected mutually through said ball electrodes.

09852847 "051101

8. The stack type semiconductor device of claim 5,

wherein one or two or more semiconductor devices of claim 4, or semiconductor devices each comprising a semiconductor element having plural electrodes on a circuit forming surface, a wiring formed at least on said circuit forming surface, having one end connected to said electrodes, a bump electrode connected to said wiring, a sealing resin for exposing the surface of said bump electrode and sealing the circuit forming surface of said semiconductor element, and a ball electrode formed on the surface of said bump electrode exposed from said resin, wherein a part of said wiring is formed also at the side surface of said semiconductor element, and said bump electrode is formed so that the side surface of the bump electrode may be nearly flush with said wiring formed at the side surface of said semiconductor element, at least a part of said ball electrode is formed so as to be electrically connected to said wiring at the side surface of said semiconductor element, and the side surface of said semiconductor element is sealed with resin exposing said wiring, and the confronting surface of said circuit forming surface is sealed with resin on the entire surface including the end surface of the wiring formed at the side surface of the semiconductor element, are mounted further on the semiconductor device of claim 4 mounted on the second semiconductor device, and said bump electrodes of the semiconductor device of claim 4 and the wiring at the side surface of the semiconductor device are connected mutually through said ball electrodes.

9. A manufacturing method of semiconductor device comprising:

a step of a nearly concave groove of a specified depth in the boundary region of a circuit forming surface of semiconductor elements, in a semiconductor wafer having a region for plural semiconductor elements forming specified circuits,

a step of forming an insulating layer in a specified region of the side surface of said nearly concave groove and circuit forming surface,

a step of forming a wiring in a specified region of said circuit forming surface including the entire surface of the inside of the nearly concave groove,

a step of forming a bump electrode of a specified height on a boundary region including the inside of the nearly concave groove forming said wiring,

a step of sealing the circuit forming surface with a resin exposing the surface of said bump electrode,

a step of polishing a confronting surface of the circuit forming surface of said semiconductor wafer and exposing the nearly concave groove from said confronting surface,

a step of sealing the entire confronting surface of the circuit forming surface of the semiconductor wafer with resin, including the end portion of the wiring formed at the exposed side surface of the nearly concave groove,

a step of forming a ball electrode on said bump electrode,

a step of cutting the semiconductor wafer along the exposed nearly concave groove, and forming plural semiconductor devices at the side surface thereof exposing said ball electrode, bump electrode and wiring, and

a step of heating the divided semiconductor devices at specified

09852847 "05111
T0T0432860

temperature, and forming a part of the ball electrode formed on the bump electrode on the wiring at the side surface of the semiconductor element.

10. The manufacturing method of semiconductor device of claim 9, further comprising:

a step of removing the resin formed in the exposed nearly concave groove from the confronting surface,

between the step of sealing the entire confronting surface of the circuit forming surface of the semiconductor wafer with resin, and the step of forming a ball electrode on said bump electrode.

11. The manufacturing method of semiconductor device of claim 10,

wherein the step of removing the resin formed in the exposed nearly concave groove from the confronting surface is a step of removing the resin by using laser.

12. A manufacturing method of stack type semiconductor device comprising:

a step of mounting a semiconductor device of claim 1 on a second semiconductor device having ball electrodes for connecting electrically to other semiconductor device, with the confronting surface of the circuit forming surface as a contact surface, so that said ball electrodes of said second semiconductor device and the re-wiring formed at the side surface of the semiconductor device of claim 1 may be nearly at same positions, and

09853847.051101

a step of heating the second semiconductor device mounting the semiconductor device of claim 1 at a specified temperature, and connecting the bump electrodes of the semiconductor device of claim 1 and the wiring formed at the side surface of the semiconductor device to the second semiconductor device through said ball electrodes.

13. A manufacturing method of stack type semiconductor device comprising:

a step of mounting a semiconductor device of claim 4 on a second semiconductor device having ball electrodes for connecting electrically to other semiconductor device, with the confronting surface of the circuit forming surface as a contact surface, so that said ball electrodes of said second semiconductor device and the re-wiring formed at the side surface of the semiconductor device of claim 4 may be nearly at same positions, and

a step of heating the second semiconductor device mounting the semiconductor device of claim 4 at a specified temperature, and connecting the bump electrodes of the semiconductor device of claim 4 and the wiring formed at the side surface of the semiconductor device to the second semiconductor device through said ball electrodes.

14. A manufacturing method of stack type semiconductor device comprising:

a step of mounting a semiconductor device of claim 1 on a second semiconductor device having ball electrodes for connecting electrically to other semiconductor device, with the confronting surface of the circuit forming surface as a contact surface, so that said ball electrodes of said

095347 05101
FOI 50 432860

second semiconductor device and the re-wiring formed at the side surface of the semiconductor device of claim 1 may be nearly at same positions,

a step of mounting one or two or more semiconductor devices of claim 1, with the confronting surface of the circuit forming surface as a contact surface, so that the re-wirings formed at the side surface of the semiconductor devices of claim 1 may be nearly at same positions, sequentially further on the semiconductor device of claim 1 mounted on the second semiconductor device, and

a step of heating the second semiconductor device mounting the plural semiconductor devices of claim 1 at a specified temperature, and connecting the bump electrodes of the plural semiconductor devices of claim 1 and the wiring formed at the side surface of the semiconductor device, mutually to the second semiconductor device and the plural semiconductor devices of claim 1 through said ball electrodes.

15. A manufacturing method of stack type semiconductor device comprising:

a step of mounting a semiconductor device of claim 4 on a second semiconductor device having ball electrodes for connecting electrically to other semiconductor device, with the confronting surface of the circuit forming surface as a contact surface, so that said ball electrodes of said second semiconductor device and the re-wiring formed at the side surface of the semiconductor device of claim 4 may be nearly at same positions,

a step of mounting one or two or more semiconductor devices of claim 4, with the confronting surface of the circuit forming surface as a

09853847 051101

contact surface, so that the re-wirings formed at the side surface of the semiconductor devices of claim 4 may be nearly at same positions, sequentially further on the semiconductor device of claim 4 mounted on the second semiconductor device, and

a step of heating the second semiconductor device mounting the plural semiconductor devices of claim 4 at a specified temperature, and connecting the bump electrodes of the plural semiconductor devices of claim 4 and the wiring formed at the side surface of the semiconductor device, mutually to the second semiconductor device and the plural semiconductor devices of claim 4 through said ball electrodes.

16. A manufacturing method of stack type semiconductor device comprising:

a step of mounting a semiconductor device of claim 1 on a second semiconductor device having ball electrodes for connecting electrically to other semiconductor device, with the confronting surface of the circuit forming surface as a contact surface, so that said ball electrodes of said second semiconductor device and the re-wiring formed at the side surface of the semiconductor device of claim 1 may be nearly at same positions,

a step of mounting one or two or more semiconductor devices of claim 1, or semiconductors each comprising a semiconductor element having plural electrodes on a circuit forming surface, a wiring formed at least on said circuit forming surface, having one end connected to said electrodes, a bump electrode connected to said wiring, a sealing resin for exposing the surface of said bump electrode and sealing the circuit forming surface of said semiconductor element, and a ball electrode

09852847 "051101
T01850 485860

formed on the surface of said bump electrode exposed from said resin, in which a part of said wiring is formed also at the side surface of said semiconductor element, and said bump electrode is formed so that the side surface of the bump electrode may be nearly flush with said wiring formed at the side surface of said semiconductor element, at least a part of said ball electrode is formed so as to be electrically connected to said wiring at the side surface of said semiconductor element, and the side surface of said semiconductor element is sealed with resin exposing said wiring, and the confronting surface of said circuit forming surface is sealed with resin on the other surface than the end surface of the wiring formed at the side surface of the semiconductor element, with the confronting surface of the circuit forming surface as a contact surface, so that the re-wirings formed at the side surface of such semiconductor devices may be nearly at same positions, sequentially further on the semiconductor device of claim 1 mounted on the second semiconductor device, and

a step of heating the second semiconductor device mounting the plural semiconductor devices at a specified temperature, and connecting the bump electrodes of the plural semiconductor devices and the wiring formed at the side surface of the semiconductor device, mutually to the second semiconductor device and the plural semiconductor devices through said ball electrodes.

17. A manufacturing method of stack type semiconductor device comprising:

a step of mounting a semiconductor device of claim 4 on a second semiconductor device having ball electrodes for connecting electrically to

other semiconductor device, with the confronting surface of the circuit forming surface as a contact surface, so that said ball electrodes of said second semiconductor device and the re-wiring formed at the side surface of the semiconductor device of claim 4 may be nearly at same positions,

a step of mounting one or two or more semiconductor devices of claim 4, or semiconductors each comprising a semiconductor element having plural electrodes on a circuit forming surface, a wiring formed at least on said circuit forming surface, having one end connected to said electrodes, a bump electrode connected to said wiring, a sealing resin for exposing the surface of said bump electrode and sealing the circuit forming surface of said semiconductor element, and a ball electrode formed on the surface of said bump electrode exposed from said resin, wherein a part of said wiring is formed also at the side surface of said semiconductor element, and said bump electrode is formed so that the side surface of the bump electrode may be nearly flush with said wiring formed at the side surface of said semiconductor element, at least a part of said ball electrode is formed so as to be electrically connected to said wiring at the side surface of said semiconductor element, and the side surface of said semiconductor element is sealed with resin exposing said wiring, and the confronting surface of said circuit forming surface is sealed with resin on the entire surface including the end surface of the wiring formed at the side surface of the semiconductor element, with the confronting surface of the circuit forming surface as a contact surface, so that the re-wirings formed at the side surface of such semiconductor devices may be nearly at same positions, sequentially further on the semiconductor device of claim 4 mounted on the second semiconductor

09524 " 422220

device, and

a step of heating the second semiconductor device mounting the plural semiconductor devices at a specified temperature, and connecting the bump electrodes of the plural semiconductor devices and the wiring formed at the side surface of the semiconductor device, mutually to the second semiconductor device and the plural semiconductor devices through said ball electrodes.

09852847 051101